



JUNE. 1988

MITSUBISHI

Service Manual

COLOR MONITOR

**MODEL
AUM-1381A****CAUTION**

Before servicing this product, it is important that the serviceman reads the "SAFETY PRECAUTIONS" and "PRODUCT SAFETY NOTICE" in this service manual.

SPECIFICATIONS

- **Picture tube** 13" viewable, 90 degree deflection
0.31 mm trio dot pitch
Super high contrast glass, Non-glare
P22, Medium-short persistence
High voltage: 22.5kV (at 0mA)
- **Video**
 - Band width** 30 MHz
 - Resolution** Mode 1. RGB TTL/ANALOG
800 dots Horizontal
560 lines Vertical
Mode 2. Composite Video
500 dots Horizontal
350 line Vertical
- **Input Signal** Comp. video: NTSC
RGB: video: TTL Positive 8/16/64
Colors
Analog 0.6 Vp-p positive
Sync.: Separate sync. TTL±HD, ±VD
Comp. sync. TTL ±HD/VD
Comp. sync. on green video
- **Connector** BNC Jack
D-Sub 9-pin
D-Sub 25-pin
- **Synchronization** Horizontal: 15.6 kHz to 36 kHz
(Automatically)
Vertical: 45 Hz to 90 Hz
(Automatically)
- **Power Input** NTSC.... AC 120 V 60 Hz
- **Power Consumption** 85 watts
- **Dimension** 362 mm(W)×328 mm(H)×383 mm(D)
14-1/4"×12-29/32"×15-5/64"
- **Unit Net Weight** 14.5 kg (32.0 lbs)
- **Special Features**
 - * Automatic tracking of wide rang horizontal and vertical scanning frequencies.
f(H): 15.6 ~ 36 kHz
f(V): 45 ~ 90 Hz
 - * Size and position of the screen can be adjusted with external controls.
 - * High-resolution color CRT, 0.31mm trio dot pitch, diamond matte coating super-high Contrast glass.
 - * Supports wide variety of input signals such as, video composite, RGBI TTL, RGB analog and TTL monochrome.
 - * Diverse displays are obtainable by inputs of various signals such as composite video, RGB TTL, analog and monochrome.

MITSUBISHI ELECTRIC CORPORATION

Head Office: Mitsubishi Denki Building. Marunouchi Tokyo, Japan
Cable Address: MELCO TOKYO

SAFETY PRECAUTIONS

NOTICE. Observe all cautions and safety related notes located inside the color monitor cabinet and on the color monitor chassis.

WARNING

1. Operation of this color monitor, outside the cabinet or with the cover removed, involves a shock hazard from the color monitor power supplies. Work on the color monitor should not be attempted by anyone who is not thoroughly familiar with precautions necessary when working on high-voltage equipment.
2. Do not install, remove or handle the picture tube in any manner unless shatter-proof goggles are worn. People not so equipped should be kept away while the picture tube is being handled. Keep the picture tube away from the body while handling.

X-RADIATION WARNING

The surface of the picture tube may generate X-Radiation. Precaution during service and, if possible, the use of a lead apron is recommended for shielding while handling.

When replacing the picture tube, use only the designated replacement part since it is a critical component with regard to X-Radiation as noted above. (No high-voltage adjustments are provided.) The high-voltage specification is described on page 1.

LEAKAGE CURRENT CHECK

Before returning the color monitor to the customer, it is recommended that leakage current be measured according to the following methods.

1. Cold Check

With the AC plug removed from the Power source, place a jumper across the two AC plug prongs. Turn the color monitor AC switch on. Using an ohm-meter, connect one lead to the jumpered AC plug and touch the other lead to each exposed metal part (screwheads, metal overlays, control shafts, etc.) particularly any exposed metal part having a return path to the chassis. Exposed metal parts having a return path to the chassis should have a minimum resistance reading of 1 megohm. Any resistance below this value indicates an abnormality which requires corrective action. Exposed metal parts not having a return path to the chassis will indicate an open circuit.

2. Hot Check

The test sequence, with reference to the measuring circuit in Fig.1, is as follows:

- (1) With switch S1 open, the color monitor is to be connected to the measuring circuit. Immediately after connection, the leakage current is measured using both positions of switch S2, and with the switching devices in the color monitor in all of their operating positions.
 - (2) Switch S1 is then to be closed, energizing the color monitor, and immediately after closing the switch, the leakage current is to be measured using both positions of switch S2, and with the switching devices in the color monitor in all of their operating positions.
- Current measurements of items (1) and (2) are to be repeated after the color monitor has reached thermal stabilization.

The leakage current shall not be more than 3.5mA.

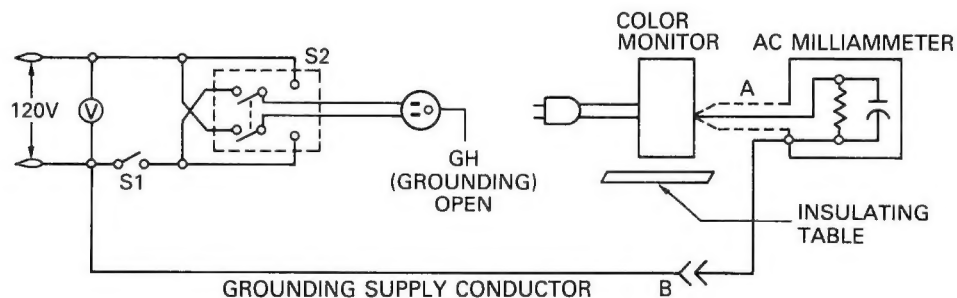


Fig. 1

PRODUCT SAFETY NOTICE

Many electrical and mechanical parts in color monitor have special safety related characteristics. These characteristics are often not evident from visual inspection nor can the protection afforded by them necessarily be obtained by using replacement components rated for higher voltage, wattage, etc. Replacement parts which have these special safety characteristics are identified in this service manual. Electrical components having such features are identified by shading on the schematic diagram and the parts list of this service manual and by marking on the supplementary sheet for this chassis to be issued subsequently. Therefore replacements for any safety parts should be identical in value and characteristics.

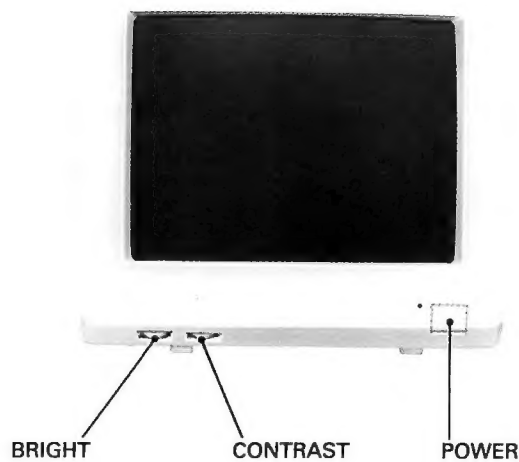


Fig. 2 Controls

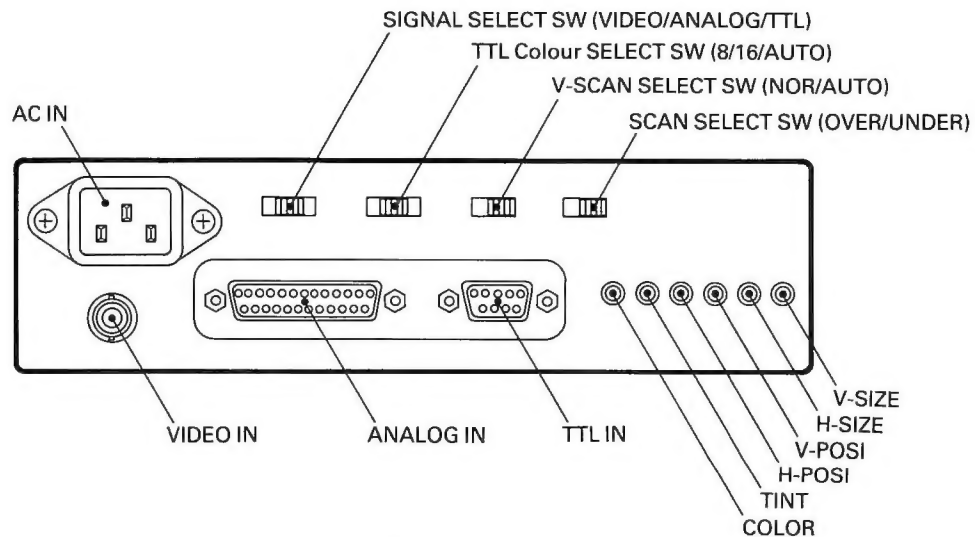


Fig. 3 Terminals

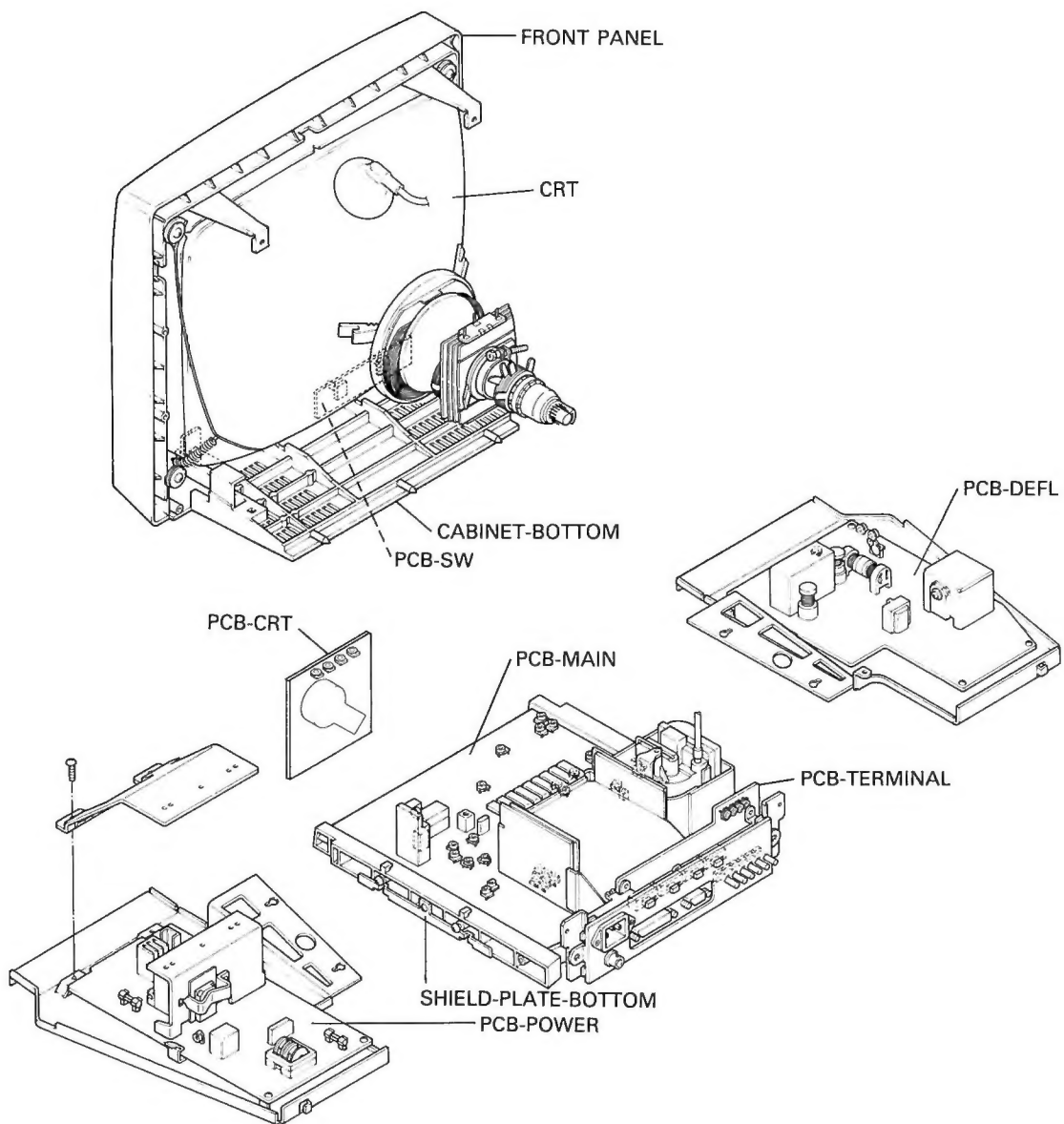


Fig. 4

Disassembly

1. Place the monitor on a table with the face facing downward.

Caution: Cover the surface of the table with a cushion, blanket, or else so that the face shall not be scored.

2. Remove the back cover by unscrewing six screws.

(2 screws at the top of the back cover, two screws at two sides of the rear panel, and 2 screws on two sides at the bottom of the back cover)

3. Set the monitor upright on the table.

4. Remove the SHIELD-PLATE-TOP by unscrewing six screws.

Remove the SHIELD-PLATE-REAR by slightly lifting upwards after removing four fastening screws.

5. Place a plate with a thickness of about 10 mm below the CABINET-BOTTOM for floating the rear of the monitor.

Caution: If the bracket fastening screws are removed without floating the rear of the cabinet, an excess force may act on the CRT PCB and the CRT, damaging them.

6. Remove two screws which fastening the bracket to the front panel on each side, and draw out the entire chassis to the operator side.

Caution: Pull the chassis by paying attention to the wires and other parts.

7. Remove two screws from the two sides of the SHIELD-PLATE-TERMINAL.

Loosen two screws fastening the bracket-POWER to the chassis. Raise the bracket slightly and turn it down to the left side.

8. Remove one screw which fastens the right bracket-DEFL to the flyback-trans, and turn down to the right side as in the above para. 7.

9. To check the rear side of the PCB-MAIN, loosen two screws fastening the SHIELD-PLATE-BOTTOM.

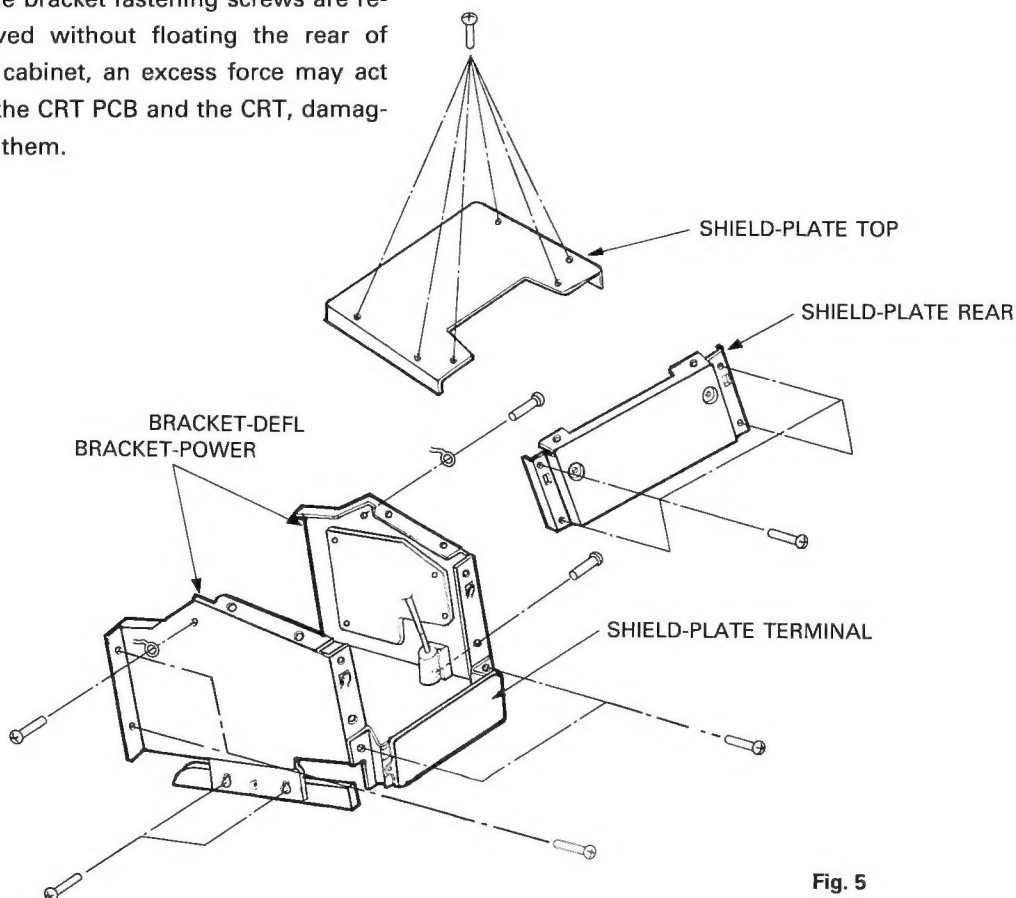
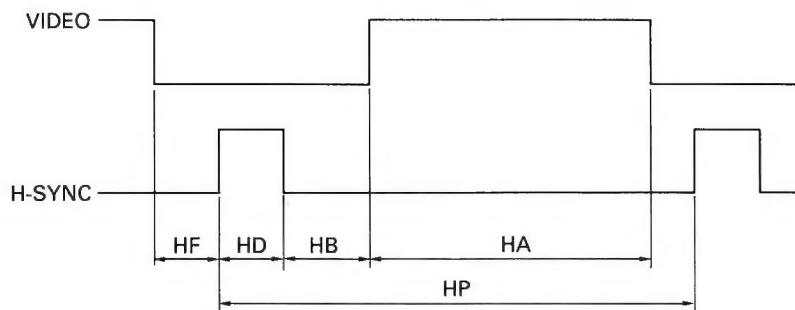


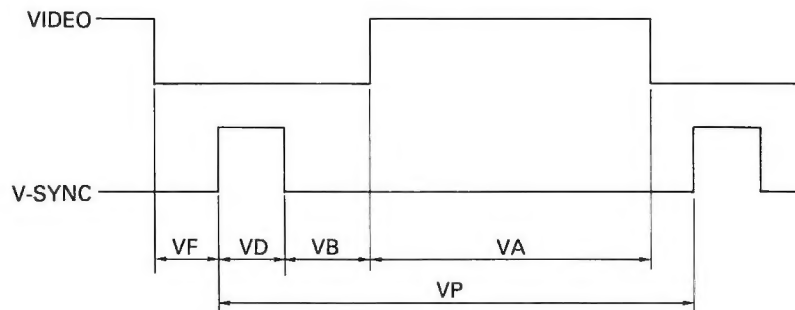
Fig. 5

TIMING CHART

HORIZONTAL



VERTICAL



| MODE | | | Horizontal Timing | | | | | Vertical Timing | | | | | Unit | f _H (kHz) | f _V (Hz) | Note |
|-------|----|----|-------------------|-------|-------|-------|--------|-----------------|--------|-------|--------|---------|-----------|-------------------------|------------------------|--------------------------------------|
| | | | HP | HF | HD | HB | HA | VP | VF | VD | VB | VA | | | | |
| M1-2 | | | 63.78 | 6.47 | 4.45 | 8.03 | 44.83 | 16680 | 1640 | 190 | 2110 | 12740 | μS | 15.7 | 60 | CGA |
| M2-1 | | | 45.75 | −0.14 | 4.924 | 1.65 | 39.62 | 16750 | 44 | 595 | 100 | 16011 | μS | 21.8 | 59.7 | EGA |
| M3-1 | | | 54.34 | 0.348 | 8.29 | 1.49 | 44.212 | 20040 | 51 | 868 | 133 | 18990 | μS | 18.4 | 50 | MDA |
| M4-1 | | | 32 | 0.64 | 5.12 | 0.64 | 25.6 | 16670 | 384 | 512 | 418 | 15356 | μS | 31.25 | 60 | |
| M5-1 | | | 32.7 | 0.2 | 4.48 | 2.36 | 25.66 | 16650 | 97 | 65 | 816 | 15672 | μS | 30.5 | 60 | PGA Mode control "H" 480 lines |
| M5-2 | | | 32.7 | 0.2 | 4.48 | 2.36 | 25.66 | 16650 | 1400 | 65 | 2120 | 13065 | μS | 30.5 | 60 | PGA Mode control "L" 400 lines |
| M6-1 | | | NTSC | | | | | | | | | | | 15.734 | 60 | |
| M6-2 | | | PAL | | | | | | | | | | | 15.625 | 50 | |
| M7-1 | | | 40.28 | 3.04 | 3.04 | 3.80 | 30.40 | 18040 | 280 | 320 | 1330 | 16110 | μS | 24.83 | 55.4 | PC-9801 |
| M7-2 | | | 41.04 | 3.04 | 3.04 | 4.56 | 30.40 | 18050 | 330 | 330 | 990 | 16420 | μS | 24.366 | 55.4 | FM-11 |
| M8-1 | | | 32.40 | 1.80 | 3.00 | 3.60 | 24.00 | 16653.6 | 64.8 | 64.8 | 777.6 | 15796.4 | μS | 30.86 | 60 | MULTI-16III Non-Interlaced |
| M9-1 | HD | VD | 31.778 | 0.636 | 3.813 | 1.907 | 25.42 | (525H) | (11H) | (2H) | (32H) | (480H) | (H) | 31.468 | 60 | PS/2 480 Line |
| | − | − | | | | | | 16683.5 | 349.5 | 63.56 | 1016.9 | 15253.4 | μS | | | |
| M9-2 | − | + | ↑ | ↑ | ↑ | ↑ | ↑ | (449H) | (13H) | (2H) | (34H) | (400H) | (H) | ↑ | 70 | PS/2 400 Line |
| | | | | | | | | 14268.3 | 413.1 | 63.56 | 1080.4 | 12711.2 | μS | | | |
| M9-3 | + | − | ↑ | ↑ | ↑ | ↑ | ↑ | (449H) | (38H) | (2H) | (59H) | (350H) | (H) | ↑ | 70 | PS/2 350 Line |
| | | | | | | | | 14268.3 | 1207.5 | 63.56 | 1874.9 | 11122.3 | μS | | | |
| M9-4 | + | + | 28.15 | 0.18 | 3.92 | 1.25 | 22.8 | 408.5H | 2H | 2H | 20.5H | 384H | (H) μS | 35.52 | 87 | PS/2 768 Line Interlaced |
| M10-1 | | | 28.34 | 1.79 | 2.0 | 3.37 | 21.18 | 525H | 3H | 3H | 39H | 480H | (H) μS | 35.28 | 67 | APPLE MAC-II SYNC ON GREEN |
| M11-1 | | | 30.45 | 2.34 | 1.76 | 2.93 | 23.41 | 410.5H | 8.5H | 5H | 22H | 375H | (H) μS | 32.84 | 80 | PC-98XL Interlaced |

★ CHECK AFTER ADJUSTMENT

Test of X-radiation protector circuit

- 1) Set INPUT SIGNAL SELECT SWITCH at the "VIDEO" position. Do not supply video signal.
- 2) Turn off the Power switch.
- 3) Connect a 180k Ω -J (R-composite 1/4W) resistor with R761 (FBT side) to GND.
- 4) Turn on the power switch.
- 5) Make sure that X-radiation protector has worked, namely, horizontal oscillation circuit has turned off.
- 6) Turn off the Power switch.
- 7) Remove the resistor (Item 3).

SERVICE ADJUSTMENT

[1] +B4 Voltage Adjustment

- 1) Receive a white pattern signal. <M2-1>
- 2) Set RGB-SUB-CONT control VR6X1 at the center position, CONTRAST control VR692 at maximum position and BRIGHT control VR691 at the click stop position.
- 3) Make sure the AC power supply voltage is at the specified value.
- 4) Set SERVICE SWITCH S201 on PCB RGB at the inside position picture tube side to obtain a horizontal line of low brightness across the screen.
- 5) Adjust CRT-BIAS (SCREEN) control VR592A until any of the red, blue or green horizontal line appear on the screen.
- 6) Return SERVICE SWITCH S201 at the center position.
- 7) Connect a DC voltmeter between the L-650 on the PCB-CRT and the chassis ground (-).
- 8) Adjust B4-ADJ control VR901 on the PCB-POWER for 172 \pm 2 V reading on the meter.

[2] Vertical Deflection Alignment <RGB>

- 1) Receive a cross-hatch signal. <M2-1>
- 2) Set V-POSI control on the rear panel so that the picture become center of raster and V-SIZE control so that vertical width becomes almost 184 mm.
- 3) Adjust V-LIN control VR402 for symmetry of vertical linearity.
- 4) Adjust V-SIZE control on the rear panel so that vertical width becomes 184 \pm 1.5 mm.

[3] Horizontal Deflection Alignment

- 1) Receive a RGB TTL signal. <M10-1>

Adjust FV-35K control VR7F4 for almost synchronization.

- 2) Receive a RGB TTL signal. <M1-2>

Adjust FV-15K control VR7F3 for almost synchronization.

- 3) Receive a composite signal. *composite*

Adjust LOW-LIMIT control VR7F5 for almost synchronization.

- 4) Receive a white pattern signal. <M2-1>

Adjust S-REG control VR771 for identity of horizontal width at CONTRAST maximum and minimum.

- 5) Set H-POSI control on the rear panel so that the picture become center of raster and H-SIZE control at minimum position.

- 6) Adjust UNDER-H-SIZE control VR5A3 so that horizontal width becomes 245 \pm 1 mm.

- 7) Receive a white pattern signal. <M1-2>

Adjust OVER-H-SIZE control VR5A4 so that horizontal width becomes 245 \pm 1 mm.

[4] RGB VIDEO Circuit

RGB TTL SIGNAL White adjustment.

- 1) Receive a RGB TTL signal. <M2-1>
- 2) Set INPUT SIGNAL SELECT SWITCH at the "TTL" position.
- 3) Set R, G, B-CUT-OFF control VR650, VR651, VR652 at full counterclockwise position. Set SUB-BRT control VR6X1 at mechanical center position.
- 4) Set G, B-DRIVE control VR6G0, VR6B0 at full clockwise position.
- 5) Set BRIGHT control VR691 at click stop position and CONTRAST control VR692 at maximum position.
- 6) Set SERVICE SWITCH S201 at the inside position (picture tube side).
- 7) Adjust CRT-SCREEN control until any of the red, blue or green horizontal line appear on the screen.
- 8) Adjust the CUT-OFF controls (VR650, VR651 or VR652) to produce a white horizontal line.
- 9) Return SERVICE SWITCH S201 at the outside position (CT connector side).

Adjust DRIVE control volume of two bright colors on the screen among G,B-DRIVE control VR6B0 and VR6R0 to obtain a pure peak white raster. (Signal: white pattern of TTL)

RGB Analog Signal White ADJUSTMENT

- 1) Set INPUT SIGNAL SELECT SWITCH at the "ANALOG" position.
- 2) Receive a RGB ANALOG signal. (a gray scale of 16 graduations.)
- 3) Adjust SUB-BRT control VR6X1 to optimum brightness.

Note: Check overall black and white tone through the normal brightness and contrast range.
If necessary, repeat steps from RGB TTL white adjust (6) to Analog white adjust (3).

RGB BEAM CURRENT ADJUSTMENT

- 1) Receive a TTL white raster (INTENSITY-"H") signal. <M2-1>
- 2) Connect a DC ammeter with 1 mA full scale between the test point TP1pin (+) and TP2pin (-) on PWB-MAIN.
- 3) Set BRIGHT control at click stop position, CONTRAST control at maximum position and H-SIZE control at minimum position.
- 4) Adjust SUB-CONT control VR6X0 for beam current of $530 \pm 20 \mu A$ on the meter.
- 5) Remove a DC ammeter.

Note: Re-adjust white adjustment at this time.

FOCUS adjustment

- 1) Receive a H-character (INTENSITY-"H") signal.
- 2) Adjust FOCUS control for best overall focus.

[5] COMPOSITE VIDEO CIRCUIT ADJUSTMENT.

CHROMA OSC VECTOR adjustment <NTSC>

- 1) Set INPUT SIGNAL SELECT SWITCH at the "VIDEO" position.
- 2) Receive a NTSC color bar signal through "VIDEO IN" terminal.
- 3) Set TINT control and COLOR control on the rear panel to mid-position.
- 4) Short circuit the test points TP41 and TP42 with a short lead wire.
- 5) Connect a 270 k Ω resistor (composition 1/4W) across TP43 and TP44.
- 6) Adjust VR631 on PCB MAIN for almost color synchronization.
- 7) Remove the short lead and 270 k Ω resistor.
- 8) Set the oscilloscope to the X-Y mode. Connect the PCB-MAIN pin terminals TP46 (B-Y OUT) and TP45 (R-Y OUT) to the oscilloscope horizontal and vertical inputs respectively to display a vector pattern on the screen.
- 9) Adjust L601 so that a R-Y vector (Y-mode) becomes 105°.

CHROMA, OSC, VECTOR adjustment.

<PAL>

- 1) Set INPUT SIGNAL SELECT SWITCH at the "VIDEO" position.
- 2) Receive a PAL color bar signal through "VIDEO IN" terminal.
- 3) Set TINT control and COLOR control on the rear panel to mid-position.
- 4) Short circuit the test points TP41 and TP42 with short lead wire.
- 5) Connect 270 k Ω resistor (composition 1/4W) across TP43 and TP44.
- 6) Adjust VR631 for optimum color saturation.
- 7) Remove the short lead and 270 k Ω resistor.
Receive a PAL G-card signal.
- 8) Set the oscilloscope to the X-Y mode. Connect TP46 (B-Y OUT) and TP45 (R-Y OUT) to the oscilloscope horizontal and vertical inputs respectively to display a vector pattern on the screen. (Fig. 6)
- 9) Adjust COLOR control on the rear panel so that Y axis becomes 3.0Vp-p.

- 10) Observing the outermost dots which correspond to normal color bar, adjust the SCB-COLOR control VR601 and L633 on PCB-MAIN alternately to almost coincide the double dot pattern equally for all color points on the scope.
- 11) Observing around the center dots, adjust the coil L601 on PCB-MAIN so that the movable points on X axis or Y axis may come up to the nearest points of the center bright dot.
- 12) Repeat step 10) and 11) above so that the outer and center dots are converged.
- 13) Detune L601 so that the movable dots may be shifted and distinguished from the center bright point. (Fig. 6)
- 14) Observing the movable dots, AÁ an BB, adjust SUB-COLOR control VR601 on PCB-MAIN so that the double dots shifted in step 13) may come up to the nearest points of X or Y axis, (Fig. 6).
- 15) Adjust L633 slightly so that the outermost dots are converged again.
- 16) If the color of both sides are prominent slightly adjust the coil L601 so that the color of both sides is less on the average.

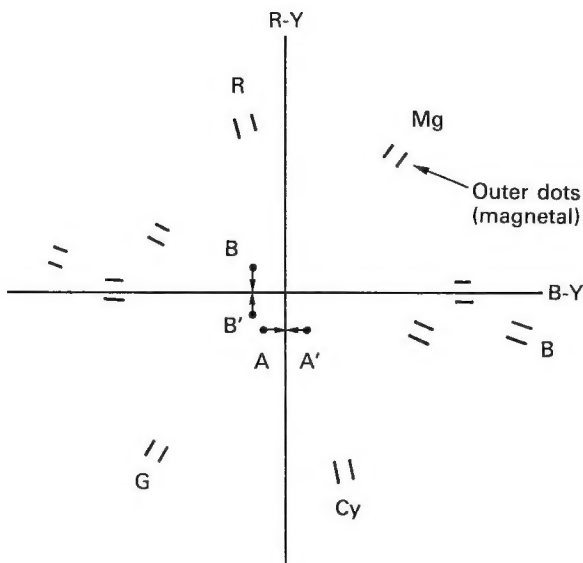


Fig. 6 Vector Pattern of G-card Signal

COMPOSITE BEAM CURRENT adjustment

- 1) Set INPUT SIGNAL SELECT SWITCH at the "VIDEO" position.
- 2) Receive a PAL or NTSC a monochrome signal through "VIDEO IN" terminal.
- 3) Set BRIGHT-control at click stop position, CONTRAST-control at maximum position, SUB-CONT control VR202 to mid-position.
- 4) Adjust SUB-BRT control VR201 on PCB MAIN for optimum brightness.
- 5) Connect a DC ammeter (class 0.5 1 mA range) between the testpoint TP1pin (+) and TP2pin (-).
Adjust SUB-CONT control VR202 for beam current of $500^{+30}_{-0} \mu A$ on the meter.

CHROMA adjustment (composite signal NTSC/PAL)

- 1) Receive a color bar signal.
- 2) Adjust COLOR-control on the rear panel for position.

[6] PURITY AND CONVERGENCE

Procedure

- 1) Remove the deflection yoke and the rubber wedges from the picture tube cone taking care not to strike or scratch the cone.
- 2) Clean the cement remaining on the deflection yoke and the surface of the picture tube cone.
- 3) Receive a full white raster.
- 4) Fit the deflection yoke on the neck of picture tube and push forward.
- 5) Fit C.P. (Magnet) Assembly to the neck of the picture tube and fasten with the screw at the position where the distance between 6-pole magnet end and the base of picture tube is as shown in Fig. 7.
- 6) Demagnetise at the front and sides of the picture tube with a degaussing coil.

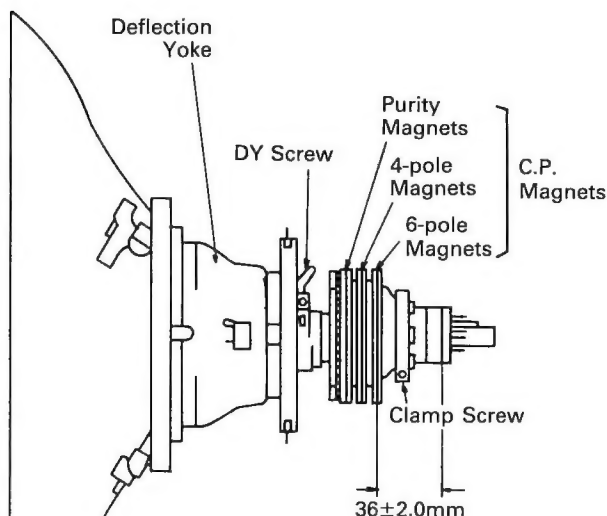


Fig. 7

Preliminary Adjustment

1 Purity

- 1) Short-circuit the base and emitter of R-BLK transistor Q6R0 and B-BLK transistor Q6B0 on PCB-MAIN to produce green raster.
- 2) With the deflection yoke positioned fully forward, adjust purity magnet so that the green ball is at the center of the screen. (Fig. 8)
- 3) Slide the deflection yoke slowly backwards to produce a uniform green raster.
- 4) Remove the shorting link.
- 5) Short-circuit the base and emitter of corresponding two transistors on PCB-MAIN as indicated in Table 1 to produce green, red, and blue rasters and to verify their purity, and fasten the DY screw on the deflection yoke temporarily.
- 6) Remove the shorting leads from respective transistors.

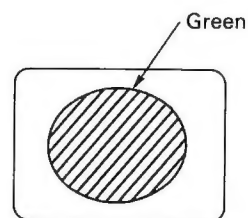


Fig. 8 Screen

Table 1 Transistors to be Short Base to Emitter to Produce Primary Color.

| Transistor Raster | R-BLK Q6R0 | G-BLK Q6G0 | B-BLK Q6B0 |
|-------------------|------------|------------|------------|
| Red | Open | Short | Short |
| Green | Short | Open | Short |
| Blue | Short | Short | Open |

2. Static Convergence

- 1) Set BRIGHT control at click stop position and CONTRAST control at maximum position. (H-SIZE; 250 ± 5 mm, V-SIZE; 180 ± 5 mm, MODE; under scan)
- 2) Adjust two 4-pole magnets to converge red and blue vertical and horizontal lines at the center of the screen.
- 3) Adjust two 6-pole magnets to converge the red and blue lines on green line at the center of the screen.

Note: 1. Adjustment of 4-pole magnets affects red blue beams.

2. Adjustment of 6-pole magnets affects red and blue beams. (Fig. 9)

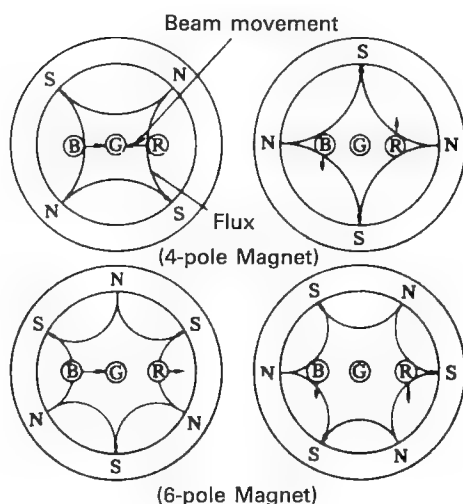


Fig. 9

3. Focus

If necessary, adjust focus. Ascertain that focus is optimum throughout the entire screen. Do not adjust focus after the following adjustments.

Regular Adjustment

1. Purity

- 1) Short-circuit the base and emitter of corresponding two transistor Q6B0 on PCB-MAIN to produce green raster.
- 2) Loosen the deflection yoke screw and move it forwards and check that the green ball is at the screen center. (Fig. 8)
If necessary, adjust purity magnets.
- 3) Slide the yoke backwards to produce a uniform green raster.
- 4) Short-circuit the base and emitter of corresponding two transistors on PCB-MAIN as indi-

cated in Table 1 to produce green, red, and blue rasters and verify their purity, then fasten the DY screw of the deflection yoke temporarily.

- 5) If necessary, repeat steps above.
- 6) Fix the yoke in position using the DY screw.

Note: When adjusting the deflection yoke position, do not touch the purity ring magnets except where necessary.

2. Static Convergence

- 1) Receive a cross-hatch signal.
- 2) BRIGHT control at click stop position and CONTRAST control at maximum position. (H-SIZE; 250 ± 5 mm, V-SIZE; 180 ± 5 mm, MODE; under scan)
- 3) Adjust 4-pole magnets to converge red and blue vertical and horizontal lines at the center of the screen.
- 4) Adjust 6-pole magnets to place the red and blue lines converged on the green lines.
- 5) If necessary, repeat steps 3) and 4) above.

3. Periphery of Convergence

- 1) Apply the magenta crosshatch signal.
- 2) Look at the top and bottom of the screen and face up or down the deflection yoke so that the vertical lines of the two side beams — blue and red — shall be merged (horizontal crossing shall be eliminated).

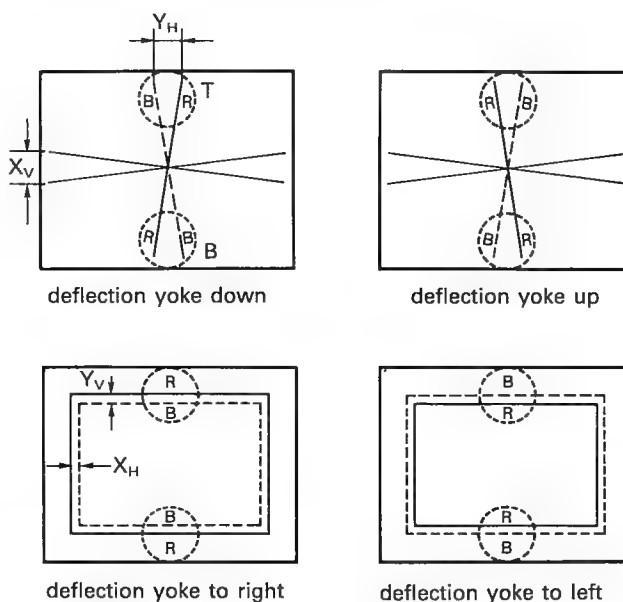


Fig. 10

- 3) Similarly look at the top and bottom of the screen, and face the deflection yoke to right or left so that the horizontal lines of the two side beams shall be merged.
- 4) On completion of the above 2 and 3 adjustment, provisionally secure the wedges.
- 5) X_v is adjustable by turning horizontal bias coil of under the deflection yoke.
- 6) X_H is adjustable by appending a magnet plate.

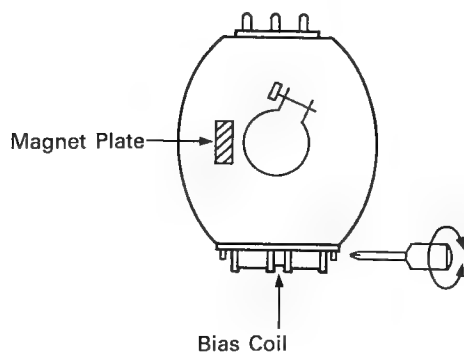


Fig. 11

4. BOW CORRECTION

Carry out the following correction steps only when the blue bow is detected.

- 1) Apply the blue and red crosshatch signal.
- 2) If a blue bow is detected on the X_v , adjust the opening angle of the bow correction 4-pole magnet ring tabs on the deflection yoke according to the intensity of the bow.

Note: Be sure that the bisector of the angle between the tabs shall be in the Y axis, in principle.

The maximum opening angle is 90° (correcting 0.25 to 0.3 mm).

Normally the closed tabs are at the 3 o'clock position.

- 3) Adjust static convergence with the 4-pole magnet of the convergence-purity assembly. Be sure that the blue bow is eliminated. If correction is not enough or excessive, readjust as in the above step 1.

* On completion of adjustment, lock the two rings in position and the two rings to the deflection yoke with locking paint.

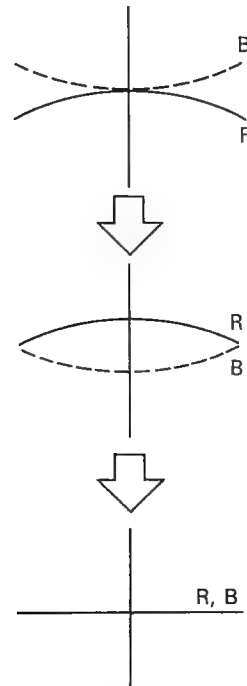


Fig. 12

MEMO

Note: If sync is lost when switching resolutions, adjust FV-35 on the main board to compensate.

PARTS LIST

In order to expedite delivery of replacement part orders.

Specify : 1.Model number/Serial number

2.Part number and Description

3.Quantity

Unless full information is supplied, delay in execution of orders will result.

* Warranty return item

RESISTOR

CAPACITOR

| MARK | TOLERANCE | MARK | TOLERANCE | MARK | TOLERANCE |
|------|-----------|------|------------------|------|------------------|
| J | ± 5 % | J | ± 5 % | Z | + 80 % - 20 % |
| K | ± 10 % | K | ± 10 % | C | ± 0.25pF |
| M | ± 20 % | M | ± 20 % | D | ± 0.5pF |
| N | ± 30 % | P | + 100 % - 0 % | F | ± 1pF |
| | | | | Q | + 30 % - 10 % |

: Critical components

| SYMBOL NO. | PARTS NO. | PARTS NAME | DESCRIPTION | SYMBOL NO. | PARTS NO. | PARTS NAME | DESCRIPTION |
|--------------------|-----------|----------------------|-------------|------------|-----------|---------------|-------------|
| ITC | | | | TRANSISTOR | | | |
| | 255B96001 | ITC ASSY | AT14A9ZNB22 | Q 201 | 260P41904 | 2SC2724-C, D | |
| INTEGRATED CIRCUIT | | | | Q 202 | 260P41904 | 2SC2724-C, D | |
| IC290 | 263P05309 | TC4053BP/MC14053 | | Q 203 | 260P41904 | 2SC2724-C, D | |
| IC2A0 | 266P01601 | LA7016 | | Q 204 | 260P45501 | DTC124F (NPN) | |
| IC2A1 | 266P01601 | LA7016 | | Q 206 | 260P45501 | DTC124F (NPN) | |
| IC2A2 | 266P98201 | AN608P | | Q 207 | 260P45501 | DTC124F (NPN) | |
| IC2A3 | 266P98201 | AN608P | | Q 210 | 260P25601 | 2SA1115-E, F | |
| IC2X0 | 267P01101 | STK192 | | Q 211 | 260P58201 | 2SK656 | |
| IC2X1 | 272P02701 | AN5862K | | Q 212 | 260P25601 | 2SA1115-E, F | |
| IC2X2 | 272P05501 | AN5860 | | Q 214 | 260P41904 | 2SC2724-C, D | |
| IC401 | 266P40501 | AN5521 | | Q 290 | 260P45501 | DTC124F (NPN) | |
| IC5A1 | 272P22601 | TDA4950 | | Q 291 | 260P45501 | DTC124F (NPN) | |
| IC5X1 | 267P01301 | STR50330 | | Q 292 | 260P45501 | DTC124F (NPN) | |
| IC601 | 266P15001 | TA7698AP | | Q 293 | 260P45501 | DTC124F (NPN) | |
| IC6B0 | 267P01201 | VPA05 | | Q 294 | 260P45501 | DTC124F (NPN) | |
| IC6G0 | 267P01201 | VPA05 | | Q 2A0 | 260P45501 | DTC124F (NPN) | |
| IC6R0 | 267P01201 | VPA05 | | Q 2A1 | 260P41904 | 2SC2724-C, D | |
| IC6X0 | 272P08101 | M51387P | | Q 2M0 | 260P13903 | 2SA564-Q | |
| IC701 | 266P09101 | SN74LS221N | | Q 2M1 | 260P13903 | 2SA564-Q | |
| IC702 | 266P84401 | SN74LS123N | | Q 2M2 | 260P13903 | 2SA564-Q | |
| IC703 | 263P05309 | TC4053BP/MC14053 | | Q 2X0 | 260P41605 | 2SC2274-E, F | |
| IC704 | 266P41901 | M5223P | | Q 2X1 | 260P41605 | 2SC2274-E, F | |
| IC705 | 266P84401 | SN74LS123N | | Q 2X2 | 260P38701 | 2SC2236-Q, Y | |
| IC707 | 266P41903 | M5223L | | Q 2X3 | 260P41605 | 2SC2274-E, F | |
| IC709 | 266P09101 | SN74LS221N | | Q 2X4 | 260P45501 | DTC124F (NPN) | |
| IC7F1 | 272P22501 | IR9331 | | Q 2X5 | 260P41904 | 2SC2724-C, D | |
| IC7F2 | 266P41901 | M5223P | | Q 2X6 | 260P25601 | 2SA1115-E, F | |
| IC7F3 | 266P41901 | M5223P | | Q 471 | 260P41802 | 2SC2481-Q, Y | |
| IC7M1 | 266P72701 | MPC339C/MC3302P | | Q 571 | 260P42201 | 2SC2482 | |
| IC7M2 | 266P84201 | SN74LS42N | | Q 572 | 260P57201 | 2SD1556 | |
| IC7M5 | 266P85301 | SN74LS08N/HD74LS08P | | Q 573 | 260P63301 | 2SK553 | |
| IC7S0 | 266P47801 | SN74LS86N | | Q 5A1 | 260P45501 | DTC124F (NPN) | |
| IC7S1 | 266P25601 | SN74LS09N | | Q 5A3 | 260P33804 | 2SC2603-E, F | |
| IC7S2 | 266P84001 | SN74LS00N/HD74LS00P | | Q 5A5 | 260P45501 | DTC124F (NPN) | |
| IC7X0 | 266P46802 | SN74LS157N/HD74LS157 | | Q 5A6 | 260P58201 | 2SK656 | |
| IC901 | 267P92101 | STR59041 | | Q 5X1 | 260P46901 | 2SA1321 | |
| IC961 | 266P93209 | NJM7805A/AN7805/L780 | | Q 5X2 | 260P38503 | 2SC2229-Q, Y | |
| IC971 | 272P24001 | M5237L | | Q 601 | 260P33804 | 2SC2603-E, F | |
| | | | | Q 602 | 260P33804 | 2SC2603-E, F | |
| | | | | Q 6B0 | 260P58201 | 2SK656 | |

| SYMBOL NO. | PARTS NO. | PARTS NAME | DESCRIPTION | SYMBOL NO. | PARTS NO. | PARTS NAME | DESCRIPTION |
|---------------|-----------|-------------------|-------------|---------------|-----------|---------------------|-------------|
| Q 6G0 | 260P58201 | 2SK656 | | D 2X0 | 264P22001 | MZ307B | |
| Q 6R0 | 260P58201 | 2SK656 | | D 2X1 | 264P22001 | MZ307B | |
| Q 6X0 | 260P58201 | 2SK656 | | D 2X2 | 264P22001 | MZ307B | |
| Q 6X1 | 260P58201 | 2SK656 | | D 2X3 | 264P04504 | 1S2471 | |
| Q 701 | 260P25601 | 2SA1115-E, F | | D 2X4 | 264P04504 | 1S2471 | |
| Q 702 | 260P25601 | 2SA1115-E, F | | D 2X5 | 264P46105 | EQA02-06B | |
| Q 704 | 260P45501 | DTC124F (NPN) | | D 2X6 | 264P04504 | 1S2471 | |
| Q 705 | 260P33804 | 2SC2603-E, F | | D 2X7 | 264P04504 | 1S2471 | |
| Q 706 | 260P33804 | 2SC2603-E, F | | D 2X9 | 264P04504 | 1S2471 | |
| Q 707 | 260P45501 | DTC124F (NPN) | | D 401 | 264P28501 | S5500D | |
| Q 711 | 260P33804 | 2SC2603-E, F | | D 501 | 264P48706 | RD12FB | |
| Q 712 | 260P33804 | 2SC2603-E, F | | D 502 | 264P04504 | 1S2471 | |
| Q 713 | 260P45501 | DTC124F (NPN) | | D 503 | 264P24401 | HZT33-01 | |
| Q 715 | 260P58201 | 2SK656 | | D 560 | 264P28501 | S5500D | |
| Q 716 | 260P58201 | 2SK656 | | D 571 | 264P53301 | RS4FS | |
| Q 731 | 260P58201 | 2SK656 | | D 572 | 264P10204 | RU-3M | |
| Q 740 | 260P33804 | 2SC2603-E, F | | D 573 | 264P10204 | RU-3M | |
| Q 7M1 | 260P45501 | DTC124F (NPN) | | D 574 | 264P46508 | EQA02-13A/RD13EB3 | |
| Q 7M5 | 260P45501 | DTC124F (NPN) | | D 575 | 264P53301 | RS4FS | |
| Q 7M6 | 260P45501 | DTC124F (NPN) | | D 5A1 | 264P04504 | 1S2471 | |
| Q 7MA | 260P45501 | DTC124F (NPN) | | D 5A2 | 264P04504 | 1S2471 | |
| Q 7MB | 260P45501 | DTC124F (NPN) | | D 5A3 | 264P46508 | EQA02-13A/RD13EB3 | |
| Q 7MC | 260P45501 | DTC124F (NPN) | | D 5X1 | 264P10202 | UF-2B/RU-3B | |
| Q 7MD | 260P45501 | DTC124F (NPN) | | D 5X2 | 264P29501 | ES-1 | |
| Q 7V1 | 260P33804 | 2SC2603-E, F | | D 5X3 | 264P29501 | ES-1 | |
| Q 7V2 | 260P33804 | 2SC2603-E, F | | D 5X4 | 264P46404 | EQA02-10B | |
| Q 901 | 260P38701 | 2SC2236-0, Y | | D 650 | 264P23101 | TVR1G | |
| Q 902 | 260P38701 | 2SC2236-0, Y | | D 651 | 264P23101 | TVR1G | |
| Q 971 | 260P46402 | 2SA940-AB. AC | | D 652 | 264P23101 | TVR1G | |
| | | | | D 656 | 264P23101 | TVR1G | |
| DIODES | | | | D 691 | 264P04504 | 1S2471 | |
| D 201 | 264P04504 | 1S2471 | | D 701 | 264P04504 | 1S2471 | |
| D 202 | 264P04504 | 1S2471 | | D 702 | 264P04504 | 1S2471 | |
| D 203 | 264P04504 | 1S2471 | | D 703 | 264P04504 | 1S2471 | |
| D 204 | 264P04504 | 1S2471 | | D 710 | 264P04504 | 1S2471 | |
| D 205 | 264P04504 | 1S2471 | | D 712 | 264P04504 | 1S2471 | |
| D 210 | 264P04504 | 1S2471 | | D 713 | 264P04504 | 1S2471 | |
| D 211 | 264P04504 | 1S2471 | | D 714 | 264P04504 | 1S2471 | |
| D 212 | 264P04504 | 1S2471 | | D 715 | 264P22006 | MZ310B/EQA02-10CDA | |
| D 213 | 264P04504 | 1S2471 | | D 716 | 264P46107 | EQA02-06D/RD6. 2EB2 | |
| D 214 | 264P04504 | 1S2471 | | D 717 | 264P04504 | 1S2471 | |
| D 215 | 264P04504 | 1S2471 | | D 718 | 264P04504 | 1S2471 | |
| D 216 | 264P22003 | MZ306/EQA02-06CDA | | D 719 | 264P04504 | 1S2471 | |
| D 217 | 264P46006 | EQA02-05C | | D 720 | 264P04504 | 1S2471 | |
| D 220 | 264P04504 | 1S2471 | | D 721 | 264P04504 | 1S2471 | |
| D 290 | 264P22001 | MZ307B | | D 722 | 264P04504 | 1S2471 | |
| D 291 | 264P22001 | MZ307B | | D 7F1 | 264P04504 | 1S2471 | |
| D 293 | 264P22001 | MZ307B | | D 7F2 | 264P46007 | EQA02-05D/RD5. 1EB2 | |
| D 280 | 264P22001 | MZ307B | | D 7F3 | 264P46007 | EQA02-05D/RD5. 1EB2 | |
| D 260 | 264P22001 | MZ307B | | D 7M1 | 264P04504 | 1S2471 | |
| D 2R0 | 264P22001 | MZ307B | | D 7M2 | 264P04504 | 1S2471 | |
| | | | | D 7M3 | 264P04504 | 1S2471 | |
| | | | | D 7M4 | 264P04504 | 1S2471 | |
| | | | | D 7M5 | 264P04504 | 1S2471 | |
| | | | | D 7M6 | 264P04504 | 1S2471 | |

| SYMBOL NO. | PARTS NO. | PARTS NAME | DESCRIPTION |
|---------------|-----------|-----------------|---------------------|
| D 7M7 | 264P04504 | 1S2471 | |
| D 7MA | 264P04504 | 1S2471 | |
| D 7MC | 264P04504 | 1S2471 | |
| D 7MD | 264P04504 | 1S2471 | |
| D 7S0 | 264P04504 | 1S2471 | |
| | | | |
| D 7S1 | 264P04504 | 1S2471 | |
| D 7S2 | 264P04504 | 1S2471 | |
| D 7S3 | 264P04504 | 1S2471 | |
| D 7V1 | 264P04504 | 1S2471 | |
| D 7V2 | 264P04504 | 1S2471 | |
| | | | |
| D 7X0 | 264P22001 | MZ307B | |
| D 7X1 | 264P22001 | MZ307B | |
| D 7X2 | 264P22001 | MZ307B | |
| D 7X3 | 264P22001 | MZ307B | |
| D 901 | 264P51201 | RBV-40B | |
| | | | |
| D 902 | 264P29501 | ES-1 | |
| D 903 | 264P29501 | ES-1 | |
| D 904 | 264P29501 | ES-1 | |
| D 905 | 264P29501 | ES-1 | |
| D 906 | 264P52201 | RU-1P | |
| | | | |
| D 951 | 264P10204 | RU-3M | |
| D 952 | 264P10204 | RU-3M | |
| D 953 | 264P35808 | RU-4YX | |
| D 954 | 264P35808 | RU-4YX | |
| D 955 | 264P10202 | UF-2B/RU-3B | |
| | | | |
| D 956 | 264P10202 | UF-2B/RU-3B | |
| D 991 | 264P39302 | SLC-26GG5 | |
| | | | |
| MISCELLANEOUS | | | |
| | | | |
| C 5X5 | 185D05201 | ELECTROLYTIC-C | H180V220 μ F-Q |
| C 906 | 185D05301 | ELECTROLYTIC-C | H200V470 μ F-M |
| DL201 | 337P09601 | DELAY LINE | |
| DL202 | 337P09901 | DELAY LINE | |
| F 901 | 283D03805 | FUSE | S3. 15A |
| | | | |
| LC6B1 | 409P40204 | EMI FILTER | |
| LC6G1 | 409P40204 | EMI FILTER | |
| LC6R1 | 409P40204 | EMI FILTER | |
| PC571 | 268P03301 | PHOTO COUPLER | ON3161-R |
| RP901 | 265P07104 | POSISTOR | PTH451C142BF5ROM140 |
| | | | |
| S 201 | 129P00709 | VR-CH-PRESETTER | SW-BAND |
| S 290 | 431C08101 | SLIDE SWITCH | |
| S 291 | 431C08101 | SLIDE SWITCH | |
| S 292 | 431C08201 | SLIDE SWITCH | |
| S 293 | 431C08201 | SLIDE SWITCH | |
| | | | |
| S 571 | 129P00709 | VR-CH-PRESETTER | SW-BAND |
| T 501 | 334P15801 | FLYBACK TRANS | |
| T 571 | 336P00903 | H. DRIVE TRANS | |
| T 5X1 | 350P39301 | POWER TRANS | |
| T 601 | 349P15902 | CHROME-BP | |

| SYMBOL NO. | PARTS NO. | PARTS NAME | DESCRIPTION |
|--------------------|-----------|----------------------|----------------|
| T 931 | 350P35003 | POWER TRANSFORMER | |
| X 601 | 285P01505 | CRYSTAL RESONATOR | 3. 579545MHZ |
| | 338P01601 | CPM ASSY | |
| | 409B06205 | DEGAUSSING COIL | |
| | 411D01402 | FERRITE CORE | |
| | | | |
| | 432P05303 | PUSH SWITCH | |
| | 449C03109 | CRT SOCKET | |
| | 451D04601 | AC POWER JACK (3P) | |
| | 641D75801 | WEDGE | |
| | | | |
| COILS | | | |
| | | | |
| L 290 | 325C12007 | PEAKING COIL | 3. 3 μ H-K |
| L 2B0 | 325C12005 | PEAKING COIL | 2. 2 μ H-M |
| L 2B1 | 325C12005 | PEAKING COIL | 2. 2 μ H-M |
| L 2G0 | 325C12005 | PEAKING COIL | 2. 2 μ H-M |
| L 2G1 | 325C12005 | PEAKING COIL | 2. 2 μ H-M |
| | | | |
| L 2R0 | 325C12005 | PEAKING COIL | 2. 2 μ H-M |
| L 2R1 | 325C12005 | PEAKING COIL | 2. 2 μ H-M |
| L 2X0 | 321C03009 | RF COIL | 4. 7 μ H-K |
| L 491 | 330P12501 | DEFLECTION YOKE COIL | |
| L 501 | 325C12201 | PEAKING COIL | 47 μ H-K |
| | | | |
| L 571 | 333P01806 | H-LIN. COIL | |
| L 572 | 409C05401 | S-C COIL | |
| L 573 | 409C05602 | PCC COIL | 150 μ H |
| L 574 | 409C05501 | P-DRIVE COIL | |
| L 575 | 409P15203 | FILTER COIL | 3300 μ H-J |
| | | | |
| L 5X1 | 351P03701 | FILTER COIL | 27 μ H-K |
| L 5X2 | 351P03701 | FILTER COIL | 27 μ H-K |
| L 601 | 349P14102 | CHROMA CW COIL | |
| L 650 | 325C11009 | PEAKING COIL | 4. 7 μ H-K |
| L 701 | 325C12007 | PEAKING COIL | 3. 3 μ H-K |
| | | | |
| L 702 | 321C01002 | RF COIL | 680 μ H-K |
| L 901 | 351P03103 | LINE FILTER | |
| L 952 | 351P03701 | FILTER COIL | |
| L 953 | 351P03701 | FILTER COIL | |
| L 954 | 351P03701 | FILTER COIL | |
| | | | |
| L 955 | 351P03701 | FILTER COIL | |
| L 956 | 351P03701 | FILTER COIL | |
| | | | |
| VARIABLE RESISTORS | | | |
| | | | |
| VR201 | 127C08007 | VR-SEMIFIXED | 1/5W B5K-M |
| VR202 | 127C08101 | VR-SEMIFIXED | 1/5W B50K-M |
| VR290 | 129C12701 | VR-BLOCK | |
| VR292 | 127C08100 | VR-SEMIFIXED | 1/5W B30K-M |
| VR293 | 127C08100 | VR-SEMIFIXED | 1/5W B30K-M |

| SYMBOL NO. | PARTS NO. | PARTS NAME | DESCRIPTION |
|------------|-----------|-------------------|---------------|
| VR294 | 127C08100 | VR-SEMIFIXED | 1/5W B30K-M |
| VR401 | 127C08105 | VR-SEMIFIXED | 1/5W B500K-N |
| VR402 | 127C08102 | VR-SEMIFIXED | 1/5W B100K-M |
| VR5A1 | 127C18008 | VR-SEMIFIXED | 1/5W B10K-M |
| VR5A2 | 127C18103 | VR-SEMIFIXED | 1/5W B200K-M |
| VR5A3 | 127C18102 | VR-SEMIFIXED | 1/5W B100K-M |
| VR5A4 | 127C18008 | VR-SEMIFIXED | 1/5W B10K-M |
| VR631 | 127C08007 | VR-SEMIFIXED | 1/5W B5K-M |
| VR650 | 127C03009 | VR-SEMIFIXED | 1/5W B20K-N |
| VR651 | 127C03009 | VR-SEMIFIXED | 1/5W B20K-N |
| VR652 | 127C03009 | VR-SEMIFIXED | 1/5W B20K-N |
| VR653 | 127C03101 | VR-SEMIFIXED | 1/5W B50K-N |
| VR691 | 129D11203 | VR PCB | 0.15W B5K-15S |
| VR692 | 129D11202 | VR PCB | 0.15W B5K-15S |
| VR6B0 | 127C08009 | VR-SEMIFIXED | 1/5W B20K-M |
| VR6G0 | 127C08009 | VR-SEMIFIXED | 1/5W B20K-M |
| VR6X0 | 127C08008 | VR-SEMIFIXED | 1/5W B10K-M |
| VR6X1 | 127C08008 | VR-SEMIFIXED | 1/5W B10K-M |
| VR701 | 127C08103 | VR-SEMIFIXED | 1/10W B200K-N |
| VR702 | 127C08008 | VR-SEMIFIXED | 1/5W B10K-M |
| VR703 | 127C08009 | VR-SEMIFIXED | 1/5W B20K-M |
| VR761 | 129D13006 | VR-SEMIFIXED | 1/4W B300K-M |
| VR771 | 127C08103 | VR-SEMIFIXED | 1/5W B200K-M |
| VR7F1 | 127C08008 | VR-SEMIFIXED | 1/5W B10K-M |
| VR7F2 | 127C08006 | VR-SEMIFIXED | 1/5W B3K-M |
| VR7F3 | 127C08009 | VR-SEMIFIXED | 1/5W B20K-M |
| VR7F4 | 127C08008 | VR-SEMIFIXED | 1/5W B10K-M |
| VR7F5 | 127C08007 | VR-SEMIFIXED | 1/5W B5K-M |
| VR901 | 127C18102 | VR-SEMIFIXED | 1/5W B100K-M |
| RESISTORS | | | |
| R 415 | 103P37804 | FUSIBLE RESISTOR | 1/4W 2.2-J |
| R 510 | 103P37804 | FUSIBLE RESISTOR | 1/4W 2.2-J |
| R 582 | 103P39103 | FUSIBLE RESISTOR | 1/2W 100-J |
| R 5AM | 103P39800 | FUSIBLE RESISTOR | 1/2W 1-J |
| R 5AN | 103P39804 | FUSIBLE RESISTOR | 1/2W 2.2-J |
| R 5XC | 102P08209 | R-CEMENT WIRE | 10W 10-K, J |
| R 661 | 103P43808 | R-FUSE METAL | 2W 4.7-K, J |
| R 7MF | 103P54307 | RESISTOR(NETWORK) | 1/8W 10K-JX4 |
| R 902 | 102P08806 | R-CEMENT WIRE | 7W 2.2-K |
| R 906 | 103P37008 | FUSIBLE RESISTOR | 1/4W 39-J |

| SYMBOL NO. | PARTS NO. | PARTS NAME | DESCRIPTION |
|------------------------|-----------|-----------------|-------------|
| PRINTED CIRCUIT BOARDS | | | |
| 920D12202 | | POWER PCB ASSY | |
| 920D07408 | | DEFL PCB ASSY | |
| 930B29001 | | MAIN PCB ASSY | |
| 930C23101 | | SW PCB ASSY | |
| 930C23201 | | CRT PCB ASSY | |
| CABINET PARTS | | | |
| 242C89301 | | AC POWER CORD | |
| 700C08508 | | BACK COVER ASSY | |
| 701A37405 | | FRONT PANEL | |
| 701A37407 | | FRONT PANEL | |
| 761D49401 | | BUTTON POWER | |
| 761D49501 | | VR KNOB | |
| MECHANICAL PARTS | | | |
| 669D21201 | | SCREW | (10P) |
| 669D22104 | | SCREW | (10P) |
| 669D22108 | | SCREW | 4X25(10P) |
| PACKING PARTS | | | |
| 802C76607 | | PACKING CASE | |
| 803B54401 | | PACKING CUSHION | |
| 829C04908 | | PACKING SHEET | |
| 831B02201 | | PACKING BAG | |
| 871C24201 | | IB MONITOR | |
| 871C34704 | | SERVICE MANUAL | |